

# Constipation (Space Adaptation)

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## Introduction

Constipation is difficult or infrequent passage of stool, or a feeling of incomplete evacuation. Constipation is occasionally encountered in the early phases of space flight and is considered Space Adaptation Syndrome (SAS)-related. Contributing factors for SAS-related constipation include decreased small and large bowel motility, dehydration secondary to space motion sickness, prespaceflight hypohydration, side effects of antimotion sickness drugs, and the cephalad fluid shifting associated with exposure to microgravity.<sup>[1]</sup> Constipation lasting for many days could become a medical concern, including the risk for fecal impaction.<sup>[2]</sup> Appropriate treatment is available on board the International Space Station (ISS) including bowel stimulants and stool softeners.<sup>[3]</sup>

## Clinical Priority and Clinical Priority Rationale by Design Reference Mission

*One of the inherent properties of space flight is a limitation in available mass, power, and volume within the space craft. These limitations mandate prioritization of what medical equipment and consumables are manifested for the flight, and which medical conditions would be addressed. Therefore, clinical priorities have been assigned to describe which medical conditions will be allocated resources for diagnosis and treatment. “Shall” conditions are those for which diagnostic and treatment capability must be provided, due to a high likelihood of their occurrence and severe consequence if the condition were to occur and no treatment was available. “Should” conditions are those for which diagnostic and treatment capability should be provided if mass/power/volume limitations allow. Conditions were designated as “Not Addressed” if no specific diagnostic and/or treatment capability are expected to be manifested, either due to a very low likelihood of occurrence or other limitations (for example, in medical training, hardware, or consumables) that would preclude treatment. Design Reference Missions (DRMs) are proposed future missions designated by a set of assumptions that encompass parameters such as destination, length of mission, number of crewmembers, number of Extravehicular Activities (EVAs), and anticipated level of*

care. The clinical priorities for all medical conditions on the Exploration Medical Condition List (EMCL) can be found here ([https://humanresearchwiki.jsc.nasa.gov/index.php?title=Category:All\\_DRM](https://humanresearchwiki.jsc.nasa.gov/index.php?title=Category:All_DRM)). The EMCL document may be accessed here ([https://humanresearchwiki.jsc.nasa.gov/images/6/62/EMCL\\_RevC\\_2013.pdf](https://humanresearchwiki.jsc.nasa.gov/images/6/62/EMCL_RevC_2013.pdf)).

Design Reference Mission	Clinical Priority	Clinical Priority Rationale
<p>Lunar sortie mission</p> <p>Assumptions:</p> <ul style="list-style-type: none"> <li>4 crewmembers (3 males, 1 female)</li> <li>14 days total</li> <li>4 EVAs/ crewmember</li> <li><u>Level of Care 3</u></li> </ul>	Shall	Constipation lasting for many days could become a medical concern. Since it is simply and easily treated, treatment capability shall be manifested.
<p>Lunar outpost mission</p> <p>Assumptions:</p> <ul style="list-style-type: none"> <li>4 crewmembers (3 males, 1 female)</li> <li>180 days total</li> <li>90 EVAs/ crewmember</li> <li><u>Level of Care 4</u></li> </ul>	Shall	Constipation lasting for many days could become a medical concern. Since it is simply and easily treated, treatment capability shall be manifested.
<p>Near-Earth Asteroid (NEA) mission</p> <p>Assumptions:</p> <ul style="list-style-type: none"> <li>3 crewmembers (2 males, 1 female)</li> <li>395 days total</li> <li>30 EVAs/ crewmember</li> <li><u>Level of Care 5</u></li> </ul>	Shall	Constipation lasting for many days could become a medical concern. Since it is simply and easily treated, treatment capability shall be manifested.

## Initial Treatment Steps During Space Flight

*A link is provided to a prior version of the International Space Station (ISS) Medical Checklist, which outlines the initial diagnostic and treatment steps recommended during space flight for various conditions which may be encountered onboard the ISS. Further diagnostic and treatment procedures beyond the initial steps outlined in the Medical Checklist are then recommended by the ground-based Flight Surgeon, depending on the clinical scenario. Please note that this version does not represent current diagnostic or treatment capabilities available on the ISS. While more recent versions of this document are not accessible to the general public, the provided version of the checklist can still provide a general sense of how medical conditions are handled in the space flight environment. Medical Checklists will be developed for exploration missions at a later point in time.*

Please note this file is over 20 megabytes (MB) in size, and may take a few minutes to fully download.

ISS Medical Checklist ([http://www.nasa.gov/centers/johnson/pdf/163533main\\_ISS\\_Med\\_CL.pdf](http://www.nasa.gov/centers/johnson/pdf/163533main_ISS_Med_CL.pdf))

## Capabilities Needed for Diagnosis

*The following is a hypothetical list of capabilities that would be helpful in diagnosis. It does not necessarily represent the current capabilities available onboard current spacecraft or on the ISS, and may include capabilities that are not yet feasible in the space flight environment.*

- Auscultation device (such as a stethoscope)
- Imaging (such as X-ray, ultrasound - to rule out bowel obstruction)

## Capabilities Needed for Treatment

*The following is a hypothetical list of capabilities that would be helpful in treatment. It does not necessarily represent the current capabilities available onboard current spacecraft or on the ISS, and may include capabilities that are not yet feasible in the space flight environment.*

- Stool softener (oral suppository)
- Milk of Magnesia
- High-fiber foods or supplements (for preventive treatment)

## Associated Gap Reports

*The NASA Human Research Program (HRP) identifies gaps in knowledge about the health risks associated with human space travel and the ability to mitigate such risks. The overall objective is to identify gaps critical to human space missions and close them through research and development. The gap reports that are applicable to this medical condition are listed below. A link to all of the HRP gaps can be found here (<http://humanresearchroadmap.nasa.gov/Gaps/>).*

- 2.01 - We do not know the quantified health and mission outcomes due to medical events during exploration missions.
- 2.02 - We do not know how the inclusion of a physician crew medical officer quantitatively impacts clinical outcomes during exploration missions.
- 3.01 - We do not know the optimal training methods for in-flight medical conditions identified on the Exploration Medical Condition List taking into account the crew medical officer's clinical background. (Closed)
- 4.01 - We do not have the capability to provide a guided medical procedure system that integrates with the medical system during exploration missions.
- 4.02 - We do not have the capability to provide non-invasive medical imaging during exploration missions.
- 4.14 - We do not have the capability to track medical inventory in a manner that integrates securely with the medical system during exploration missions.
- 4.15 - Lack of medication usage tracking system that includes automatic time stamping and crew identification
- 4.17 - We do not have the capability to package medications to preserve stability and shelf-life during exploration missions.
- 4.23 - We do not have the capability to auscultate, transmit, and record body sounds during exploration missions.
- 4.24 - Lack of knowledge regarding the treatment of conditions on the Space Medicine Exploration Medical Condition List in remote, resource poor environments (Closed)
- 5.01 - We do not have the capability to comprehensively manage medical data during exploration missions.

## Other Pertinent Documents

### List of Acronyms

<b>D</b>	
DRM	Design Reference Mission
<b>E</b>	
EMCL	Exploration Medical Condition List
EVA	Extravehicular Activity
<b>I</b>	
ISS	International Space Station
<b>M</b>	
MB	Megabyte
<b>N</b>	
NEA	Near-Earth Asteroid
<b>S</b>	
SAS	Space Adaptation Syndrome
<b>X</b>	
X-ray	Radiograph

## References

1. Marshburn TH. Acute Care. In: Barratt M, Pool S, editors. Principles of Clinical Medicine for Space Flight. New York: Springer; 2008. p. 101-22.
2. Merck Manual. Constipation, Porter RS, editor. 2011. Whitehouse Station, N.J, Merck Sharp & Dohme Corp. p. 83-88.
3. International Space Station Integrated Medical Group. Medical Checklist ISS- All Expeditions. Houston: National Aeronautics and Space Administration; 2008 (Internal NASA document – Not publicly available).

## Last Update

This topic was last updated on 8/12/2014 (Version 2).

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